Claims

We claim:

[c1]

1. An electronic digital image processing system incorporating cognitive, psychophysical, and perceptual principles, comprising one or more pre-processors, a processing engine with multiple processing units each re-parameterizing input variables to graded category variables to accomplish processing functions such as color segmentation and grouping by similarities, a perceptual schema database, and an output generator that produces structured image data.

[c2]

2. The system of claim 1, wherein the processing algorithms and mechanisms re-parameterize input variables which correspond to physical properties of the ambient image array to graded category or concept variables corresponding to perceptual principles, and cognitive and psychophysical prototypes.

[c3]

3. The system of claim 1, wherein the system processes digital images in an adaptive fashion, with each processing unit making adjustments to the data in the schema and adapting the data adjustments made by other processing units in processing the digital image.

[c4]

4. The system of claim 1, wherein the processing units are inter-dependent with each processing unit employing output from other processing units and provides output for use by other processing units in their respective processing function.

[c5]

5. The system of claim 1, wherein a schema with hierarchical structure is employed to encode perceptual hypotheses, super-ordinate categories, primary visual primitives, and visual attributes.

[c6]

6. The system of claim 1, wherein data derived by psychological survey methods, including identification of typicality metrics, prototypes, relative ordinate designation, and relative context within a data structure, are used in the processing of digital image.

[c7]

7. The system of claim 1, wherein numerical data are re-parameterized into linguistic category data and organized within a perceptual schema and an image descriptor.

[c8]

8. The system of claim 1, wherein a fuzzy perceptual inference system is employed to transform numeric data into linguistic data.

[c9]

9. The system of claim 1, wherein an image descriptor, comprising of linguistic and numeric data is used to describe a digital image and organized relative to other variables designating ordinate position and corresponding level of human perceptual designation as well as world context, is used to provide perceptual decision-relative descriptions of a visual image.

[c10]

10. The system of claim 5, wherein data derived by psychological survey methods including typicality survey and motor interaction studies is employed to construct schemas that incorporate expert human knowledge.

[c11]

11. A data structure for describing the perceptual data of the digital image comprising:

numeric data that describe the digital image;

linguistic data that describe the digital image;

indices that identify the data with each level of processing such as ordinate level within schema structure, perceptual schema, and human categorization; and

labels that associate the data with perceptual concepts.

[c12]

12. A method of query processing in an electronic image retrieval system, comprising:

receiving one or more query input describing the image in linguistic terms;

translating the linguistic query input into a query image descriptor that conforms to the schema of claim 2;

comparing the query image descriptor to the image descriptor of images stored in a database; and

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retrieving the image with image descriptor that most closely matches the query image descriptor.

[c13]

13. A method of analyzing visual information, comprising:

an electronic spreadsheet that accepts digital images and their image descriptors as input to its cells;

means for reading the data in the image descriptors; and

formulas that operate on the data contained in the image descriptors.